

THE BIOLOGY AND IMMATURE STAGES OF
SPHINGICAMPA ALBOLINEATA AND *S. MONTANA* IN
ARIZONA (SATURNIIDAE)

PAUL M. TUSKES

7900 Cambridge #141G, Houston, Texas 77054

ABSTRACT. The biology and immature stages of *Sphingicampa abolineata* and *Sphingicampa montana* are described for the first time. The larvae of both species have five instars. Development is rapid with only 34-40 days required to progress from egg to adult. Evidence indicates that *S. abolineata* is multiple brooded. The larval host plant in Arizona is probably prairie acacia, *Acacia angustissima*. The larval host of *S. montana* in Arizona remains unknown but based on a selection of native Arizona legumes offered to larvae, only sweet acacia, *Acacia farnesiana*, was found to be acceptable.

Biological information regarding *Sphingicampa abolineata* (Grote & Robinson) and *Sphingicampa montana* (Packard) has been lacking due in part to the rarity of both species, their restricted distribution within the United States, and a past inability to rear the larvae in captivity. Ferguson (1971) noted that nothing was known about the biology or immature stages of either species and was able to find only six U.S. records for both species combined. The purpose of this paper is to present new information on the biology, distribution, and immature stages of *S. abolineata* and *S. montana*.

Sphingicampa abolineata

Sphingicampa abolineata is a Mexican species which extends north to southern Arizona and Texas. In Arizona the species has a very limited distribution and is a resident species in the Huachuca Mts. which straddle Cochise and Santa Cruz cos. Specimens have been collected most frequently at Washington Camp, Copper Canyon, Miller Canyon, Garden Canyon, and occasionally in Ash Canyon. Most Arizona specimens have been captured between early July and mid August with the majority from the first week of August; there is evidence of a second generation which flies in mid September.

Recent records from Texas and northern Mexico indicate two or possibly three generations occur per year in those areas. Current Texas records include: Black Gap Refuge, Brewster Co., IV-29-82; Brownsville-Southmost, Hidalgo Co., IV-18-82, VI-2-84, X-7-82, and X-20-74. Ferguson (1971) also cited a record for Brownsville, XI-10-28. Specimens from the Gomez-Farias area in Coahuila, Mexico were collected X-10-77. A series from Temoris in Chihuahua, Mexico was captured between 19 July and 28 August which is similar to the main flight period in Arizona.

Phenotypically, adults from Arizona, western and southern Texas, Chihuahua and Coahuila, Mexico appear indistinguishable. There is, however, variation in the male genitalia between some of these populations. Texas and Coahuila specimens have a very distinct long thin spine on the valve of the male genitalia. Males from central Chihuahua have no spine on the valve, while those from Arizona have a short stout spine. Fifteen genitalia were examined, and the pattern appeared consistent. Because Arizona and Texas populations can be separated on the basis of the male genitalia, it is possible that their status may change. Therefore, it should be noted that all biological observations reported here are based on observations of the Arizona population.

The habitats in which adults have been taken are quite diverse and range from thorn forest and oak grassland to mixed forest. Prairie acacia, *Acacia angustissima* (Mill.), is one of the few legumes found at all locations where adults have been captured in the Huachuca Mts. *Acacia angustissima* occurs in southern Arizona, Texas and Mexico and is a short, multiple-stemmed thornless species with bipinnately compound leaves and white flowers. Seeds of *angustissima* were collected in the fall and germinated so that potted plants would be available if any females were captured. The following year a female was collected at the mouth of Copper Canyon and allowed to oviposit in a paper bag.

The ova are green in color and dorsoventrally compressed forming a flattened ovoid with a diameter of 2.4×1.9 mm. As the embryo develops, small gas bubbles appear before the head and body develop. At 29°C the ova hatched in 9–11 days. There are five larval instars, and development is rapid, requiring only 5–6 weeks to progress from egg to adult.

In addition to the suspected host, larvae were offered various native legumes with mixed results. All larvae perished in the first or second instar when offered screwbean mesquite, *Prosopis pubescens* Benth.; Jerusalem-thorn, *Parkinsonia aculeata* L.; paloverde, *Cercidium floridum* Benth.; or sweet acacia, *Acacia farnesiana* Willd. Larvae reared on honeylocust, *Gleditsia triacanthos* L., had heavy mortality; most survivors were stunted and required 3–6 weeks longer to develop compared to those reared on *A. angustissima*. Honeylocust is a common host plant for *Sphingicampa bicolor* (Harris) and *S. bisecta* (Lintner), both of which are from the eastern United States, while mesquite is the most frequent host of *S. heiligbrodti* (Harvey) and *S. hubbardi* (Dyar) from the southwest. Larvae offered *A. angustissima* developed to maturity and pupated in 21 to 28 days without mortality. Prairie acacia is presumed to be the native host plant of *albolineata* in southern Arizona. Texas prairie acacia, *Acacia texensis* Torr. & Gray, has been

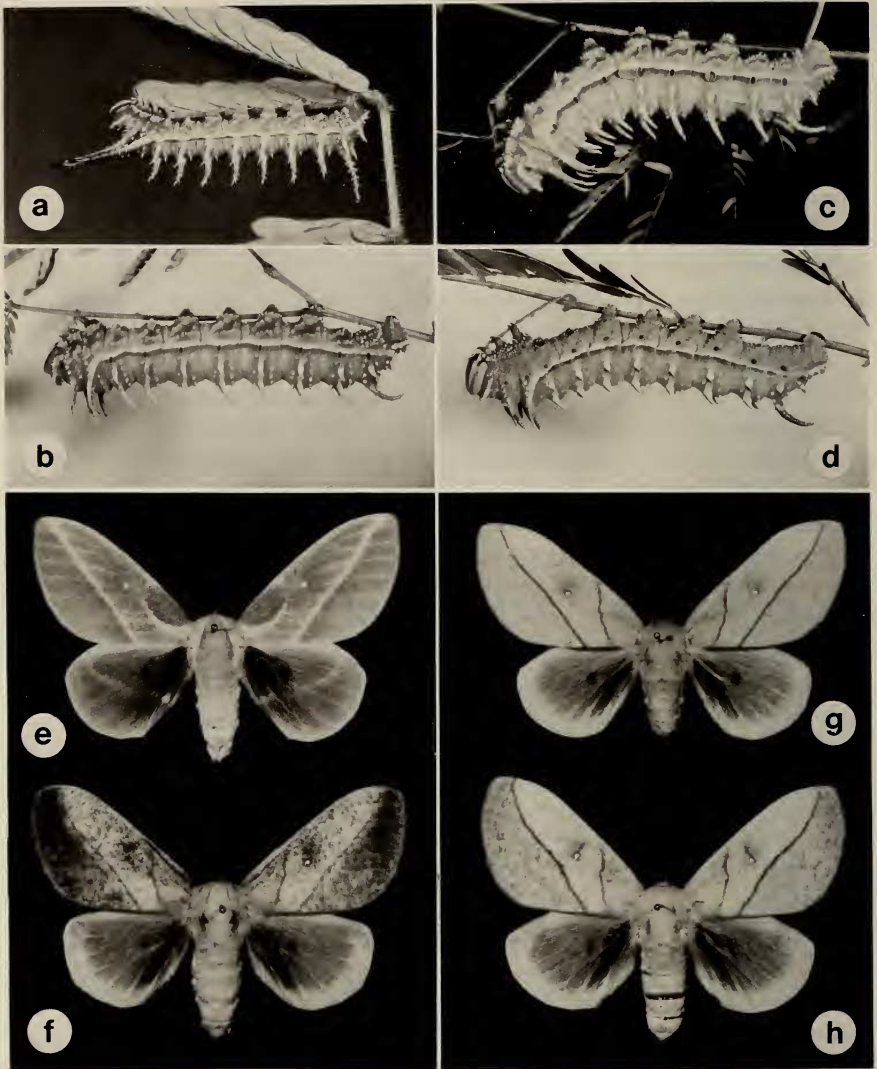
treated as a subspecies of *angustissima* and was an equally suitable host.

First instar larvae reared on *angustissima* cling to the underside of the petiole and feed at the base of the leaflet. By the end of the second day they are large enough to consume a leaflet without moving completely off the petiole. During the 3rd through last instar they chew a notch on the underside of the petiole and bend the entire leaf back; the petiole gives way at the weak point and easily bends into a "v" without separating from the plant (Fig. c). In this manner the larva is able to consume the distal-most leaflets without having to crawl to the tip. Although feeding damage is light during the first four instars, the mature larva will consume all of the edible leaves on three to five stems. Larvae prefer to feed on leaves of intermediate age. Old leaves are avoided and the new growth is not eaten until those of intermediate age are consumed. The larva will often leave the plant and wander on the ground in search of a new plant prior to consuming the oldest and most discolored leaves.

While on the plant the larva is difficult to find because of its cryptic coloration. The silver dorsal and dorsolateral blade-like scoli break up the solid green pattern and give the larva the general appearance of the thin bipinnately compound leaves on the acacia. Prior to pupation the larval coloration changes from a leaf green to dull green, and within hours it leaves the plant in search of a pupation site in the soil. The pupae reared from ova collected on 31 July eclosed between 16 and 24 September. They in turn produced another brood which pupated in mid October of the same year.

Based on the mid September emergence of reared material and a field record from Miller Canyon (IX-14-71) it is probable that at least a partial second flight occurs. Considering the rarity of the moth and the lack of spring and fall collecting efforts, it is not surprising that additional late summer records are lacking.

In captivity adults emerged from the soil after sunset to 0500 h, with a peak between 2200 and 2400 h. Wing expansion is rapid and adults are ready to fly within one hour (Fig. e). Individuals that hatch after 0300 h usually remained quiescent until the next night. In the field moths are generally attracted to black lights between 2300 and 0330 h. Mating occurs after 2200 h, and the pair remain together until the following evening. Females that were allowed to oviposit on caged potted plants deposited eggs singly on the underside of the leaflets. Larval and adult phenotypes within the Arizona population are very uniform. The larval description is based on reared material from ova deposited by a female captured at the mouth of Copper Canyon, Cochise Co., Arizona.



FIGS. a-h. a, late second instar *Sphingicampa albolineata* larva feeding on leaflet. b, mature fifth instar *S. albolineata* larva. c, fifth instar *S. albolineata* larva on stem while consuming leaflets and petiole, note notched petiole. d, mature fifth instar *S. montana* larva, note differences in length and shape of dorsal scoli and size and number of small tubercles on lower lateral surface. Adult females: e, *S. albolineata*; f, *S. montana*, dark form with numerous brownish-black spots on forewings; g, *S. montana*, light form with few or in some instances no brownish-black forewing spots; h, *S. montana*, typical phenotype.

Larval Descriptions

First instar. Head. Diameter 0.9 mm. Light brown with few short brown secondary setae. Dark brown line extends from antenna tapering dorsally to vertex of each lobe; frontal area dark brown. **Body.** Ground color green. Length 8.5–9.0 mm, width 2.0 mm. Dorsal and dorsolateral meso- and metathoracic scoli (2.0–2.2 mm) light brown with short black spines on shaft; tip of each scoli with small brown bulb each with 2 short black spines. Dorsal intersegmental area between meso- and metathoracic segments reddish brown. Abdominal dorsal, dorsolateral and lateral scoli green and raised with thin black spine extending from each. Mid-dorsal caudal scolus (0.7 mm) light brown with numerous short black spines on shaft. Lateral surface with thin dark bluish green line above lateral scoli, extending from abdominal (A) segment 1 to A8. Ventral surface and true legs green. Prolegs green with dark green shields.

Second instar (Fig. a). Head. Diameter 2.7 mm. Color green with yellow medial and black distal stripe extending from antennae, tapering dorsally to vertex of each lobe. **Body.** Ground color green. Length 14–15 mm, width 2.5 mm. Dorsal and dorsolateral meso- and metathoracic scoli elongated (1.8–2.0 mm), yellow at base with reddish brown shafts. Shaft with numerous short black spines; scoli tip with small brown bulb each with 2 short black spines. Dorsal intersegmental area between meso- and metathoracic scoli maroon. Dorsal abdominal scoli light green with light green blade-like projections. Dorsal lateral scoli similar to dorsal scoli but half their size. Lateral scoli yellow and reduced in size. Sublateral scoli appear as spines on A1, A2, and A7. All abdominal scoli with short single black spine. Mid-dorsal caudal scolus (1 mm) green basally with reddish brown shaft; numerous short black spines on shaft. Thin black spiracular and light yellow subspiracular line that encompasses lateral scoli, extends from A1 to A8. Ridge of small light yellow tubercles form collar on dorsal anterior portion of prothoracic segment. Numerous small light yellow tubercles appear on dorsal, lateral, and ventral surfaces, some of which form a ring around base of each proleg. Prolegs green. True legs light tan.

Third instar. Head. Diameter 2.3–2.5 mm. Color green with light yellow stripe extending from antennae, tapering dorsally to vertex of each lobe; ocelli at inferior edge of line. **Body.** Ground color green. Length 19–21 mm, width 4.7 mm. Dorsal meso- and metathoracic scoli blue, dorsolateral scoli green. Both dorsal and dorsolateral scoli enlarged with short black spines on shaft; tips of scoli with small reddish brown bulb, each with 2 small black spines. Dorsal intersegmental area between meso- and metathoracic segments maroon. Dorsal and dorsolateral abdominal scoli blade-like, light yellow at base with silver shaft. Abdominal lateral and sublateral scoli reduced and light yellow. Mid-dorsal caudal scolus green with small green spines. Maroon spiracular line extends from A1 to A8. White line extends from base of dorsolateral metathoracic scoli to become subspiracular line extending from A1 to A8. Ridge of small light yellow tubercles form collar on dorsoanterior portion of prothoracic segment and ridge between meso- and metathoracic dorsal scoli. Ridge of yellow tubercles start just dorsal to maroon spiracular line and extends over back on posterior and anterior portions of each abdominal segment. Light yellow tubercles form ring around base of each proleg, and form 2 poorly organized somewhat diagonal lines between prolegs and lateral scoli. True legs and prolegs green.

Fourth instar. Head. Diameter 3.2–3.4 mm. Color green with light yellow stripe extending from antenna, tapering dorsally to vertex of each lobe. **Body.** Ground color green. Length 31–36 mm, width 6 mm. Dorsal meso- and metathoracic scoli turquoise-blue with small black spines on shaft. Dorsolateral meso- and metathoracic scoli green with small green spines on shaft. Dorsal intersegmental area between meso- and metathoracic segments green or with trace of maroon. Dorsal and dorsolateral abdominal scoli blade-like with yellow base and silver shaft; mesal portion green. Lateral and sublateral abdominal scoli reduced to small yellow spines. Mid-dorsal caudal scolus green with small white or yellow spines on shaft. Pinkish red spiracular line extends from A1 to A8. White line extends from base of dorsolateral metathoracic scoli to become subspiracular line extending from A1 to A8. Ridge of small light yellow tubercles form collar on dorsoanterior portion of prothoracic segment and ridge between meso- and metathoracic dorsal scoli. Ridge of yellow tubercles start just dorsal to spiracular line and extend over back

on posterior and anterior portions of each abdominal segment. Light yellow tubercles form ring around base of each proleg and form 2 poorly organized diagonal lines between prolegs and subspiracular line. Series of yellow tubercles on lateral thoracic segments just dorsal to true legs forming transverse lines on the ventral segmental area of A1 and A2. Spiracles orange. True and prolegs green.

Fifth instar (Figs. b, c). **Head.** Diameter 4.5–5.5 mm. Color bluish green with light yellow stripe extending from antennae, tapering dorsally to vertex of each lobe. Antennae light yellow. Clypeus green and cream. **Body.** Ground color green. Length 54–60 mm, width 10–12 mm. Dorsal meso- and metathoracic scoli turquoise-blue with yellow tips; shaft smooth or slightly knobbed. Dorsolateral meso- and metathoracic scoli yellow with silver base; shaft with short white knobs bearing short setae. A line of yellow or silver tubercles cross over the mid-dorsal area forming ridge between meso- and metathoracic dorsal scoli. Dorsal intersegmental area between meso- and metathoracic segments green. Dorsal and dorsolateral abdominal scoli blade-like with silver shaft; mesal portion green. Lateral and sublateral abdominal scoli reduced to yellow knobs with small whitish setae extending from each. Mid-dorsal caudal scolus greenish yellow with small knobs on shaft. Approximate scoli length: thoracic dorsal and dorsolateral, 6–7 mm; mid-dorsal caudal, 5–6 mm; dorsal abdominal, 3.5 mm; dorsolateral abdominal, 2 mm. All enlarged scoli either curved or oriented with their tips in posterior direction. Purplish pink spiracular line extends from A1 to A8. White or cream colored subspiracular line extends from base of dorsolateral metathoracic scoli to A8. Bridge of small light yellow or silver tubercles from collar on dorsal anterior portion of prothorax. A more widely spaced ridge of smaller silver tubercles starts just dorsal to spiracular line and extends over back on posterior and anterior portions of each abdominal segment. Light yellow tubercles form ring around base of each true leg and base and tip of each proleg. A series of silver and yellow tubercles form 3 ridges on lateral surface: diagonal ridge above base of prolegs; cradle under lateral scoli; on lateral thoracic segments just dorsal to true legs. Ventral surface of A1, A2, and frequently A7 and A8 with enlarged yellow tubercles forming prominent transverse segmental ridge. Anal shield yellow or yellow and silver with silver tubercles. True legs and prolegs green. Spiracles orange.

Sphingicampa montana

Although present in portions of northern Mexico, *Sphingicampa montana* has an extremely limited distribution in the United States and is known from only a few locations in southern Arizona. Ferguson (1971) cited five records for this species, all from Pena Blanca Lake, with capture dates from 18 July to 8 August. In addition to Pena Blanca Lake, this species has been collected at Sycamore Canyon, Nogales, and Patagonia in Santa Cruz Co. and Madera Canyon and Box Canyon, Pima Co. The flight season extends from late June to mid August with a peak between 26 July and 8 August.

In Arizona, adults are associated with areas dominated by thorn forest. The larval host plant in Arizona remains unknown since larvae have not been field collected. First instar larvae were offered a wide variety of native legumes in an effort to find a suitable host plant. Larvae reared on sweet acacia, *Acacia farnesiana* Willd. developed from egg to adult in six weeks with no mortality. The larvae offered other native legumes usually died during the first or second instar; these plants included: screwbean mesquite, *Prosopis pubescens*; Jerusalem-thorn, *Parkinsonia aculeata*; paloverde, *Cercidium floridum*;

prairie acacia, *Acacia angustissima*; and *Mimosa* spp. Some larvae were successfully reared to maturity on honeylocust, *Gleditsia triacanthos*. It is interesting to note that the two legumes accepted by *montana* larvae are either totally unacceptable to *albolineata* larvae or result in stunted growth and high larval mortality. Conversely, *montana* larvae could not be reared successfully on prairie acacia, which is the larval host plant for *albolineata*. Steve Prchal (pers. comm.) has collected larvae which are believed to be that of *montana* in Sonora, Mexico. The larvae were feeding on *Haematoxylon brasalita* and a large leaved cassia, *Cassia emarginata*, and were reared to maturity on sweet acacia.

The larvae reared from eggs deposited on 3 August developed rapidly and emerged as adults between 18 and 27 September and subsequently produced another generation which pupated between 14 and 23 October. The adults reared from larvae collected in Mexico during late August by Prchal emerged beginning on 7 September. There are no records which indicate a fall flight, thus, the second brood may have been an artifact of the rearing conditions.

The larval feeding habits, female oviposition and mating behavior are similar to those described for *albolineata*. The only major difference is that the petiole of sweet acacia is much shorter than that of prairie acacia. As a result, mature *montana* larvae consumed the entire leaf without notching the petiole. On longer petiole leaves, such as honeylocust, the petiole was notched so that it could be bent towards the larva. Little phenotypic variation was observed among the larvae (Fig. d). Of 78 mature larvae only one individual lacked the enlarged silver dorsal and dorsolateral scoli on a single segment. Steve Prchal indicated that larvae collected in Mexico have little or no silver coloration but when their offspring were reared on *Acacia smallii*, a small-leaved acacia, the majority had silver on all segments.

The adults are variable. Some have brown wings and brown bodies; some have brown wings and yellow bodies; and some have yellow wings and yellow bodies. In addition, the brownish black spots of the forewing, which are common on most specimens may be totally absent (Fig. g) or so dense as to give the marginal area a blackish appearance (Fig. f). The specimens which Ferguson (1971) illustrated in color are typical of most wild specimens. The colors of reared specimens are richer, and in the females the medial forewing area is much lighter in coloration than the basal or marginal area of the wing (Fig. h). Newly emerged brown specimens are a deep tan, while yellow ones are actually a golden yellow.

The larval description is based on reared material from ova deposited by a female captured at Pena Blanca Lake, Santa Cruz Co., Arizona.

Larval Descriptions

First instar. Head. Diameter 0.9 mm. Light brown with few short brown secondary setae. Dark brown line extends from antenna tapering dorsally to vertex of each lobe. **Body.** Ground color green. Length 8.0–9.0 mm, width 1.8 mm. Dorsal and dorsolateral meso- and metathoracic scoli brownish red with short black spines on shaft; tip of each scoli with small black bulb each with 2 short black spines. Abdominal dorsal, dorsolateral and lateral scoli green and raised with thin black spine extending from each. Mid-dorsal caudal scoli brownish red with numerous short black spines on shaft. Caudal scoli about 3 times longer than dorsal abdominal scoli. Lateral surface with thin dark bluish green line above lateral scoli, extending from abdominal segment 1 to 8. Ventral surface green, true legs light brown or green, prolegs brown.

Second instar. Head. Diameter 1.8 mm. Color green with yellow medial and black distal stripe extending from antennae, tapering dorsally to vertex of each lobe. **Body.** Ground color green. Length 12–14.5 mm, width 2.2 mm. Dorsal and dorsolateral meso- and metathoracic scoli elongated and brown with numerous short brown spines on shaft. Tip of each with small brown bulb each with 2 short black spines. Dorsal abdominal, dorsolateral and lateral scoli light yellow with dark brown blade-like projection extending from each, lateral scoli reduced in size. Sublateral scoli appear as short spine on A1, A2, and A7. Mid-dorsal caudal scoli brown with numerous short brown spines on shaft. Thin purplish brown spiracular and light yellow subspiracular line, that encompasses lateral scoli, extends from A1 to A8. Numerous small light yellow tubercles appear on the dorsal, lateral and ventral surfaces. Prolegs green with brown shields, true legs light brown.

Third instar. Head. Diameter 2.4–2.6 mm. Color, green with light yellow, black stripe extending from antennae, tapering dorsally to vertex of each lobe; ocelli at inferior edge of line. **Body.** Ground color green. Length 17–19 mm, width 4 mm. Dorsal meso- and metathoracic scoli brownish red, dorsolateral thoracic scoli yellowish brown. Both dorsal and dorsolateral thoracic scoli enlarged with short black spines on shaft; tips of scoli with small brown bulb each with 2 small black spines. Dorsal and dorsal abdominal scoli blade-like and silver and green. Abdominal lateral and sublateral scoli yellow and reduced. Mid-dorsal caudal scoli reddish brown with short cream colored spines. Red subspiracular line and yellow subspiracular lines extend from base of dorsolateral metathoracic scoli to A8. Ridge of small light yellow tubercles form collar on dorsoanterior portion of prothoracic segment. Ridge of yellow tubercles start just dorsal to spiracular line and extend over back on posterior and anterior portions of each abdominal segment. Light yellow tubercles form ring around base of each proleg, and scattered on lateral surface between prolegs and subspiracular line. True and prolegs green.

Fourth instar. Head. Diameter 3.4–3.6 mm. Color green with light yellow stripe extending from antennae, tapering dorsally to vertex of each lobe. **Body.** Ground color green. Length 31–36 mm, width 5.5 mm. Dorsal meso- and metathoracic scoli blue with small black spines on shaft. Dorsolateral meso- and metathoracic scoli green to yellow with black or white short spines on shaft. Dorsal and dorsolateral abdominal scoli blade-like with silver shaft; mesal portion red. Lateral and sublateral abdominal scoli reduced to small red spines. Mid-dorsal caudal scoli red or green with small light yellow spines on shaft. Thin pink spiracular line extends from A1 to A8. Light yellow line extends from base of dorsolateral metathoracic scoli to become subspiracular line extending from A1 to A8. Ridge of small light yellow tubercles form collar on dorsoanterior portion of prothoracic segment. Ridge of yellow tubercles start just dorsal to spiracular line and extends over back on posterior and anterior portions of each abdominal segment. Yellow tubercles form ring around base of each proleg, and true leg, and scattered on lateral surface below subspiracular line. A series of yellow and silver tubercles traverse mid-dorsal area of meso- and metathoracic segments forming a line that connects base of dorsal thoracic scoli, another series forms transverse line on ventral segmental area of A1 and A2. Anal shield green with yellow, silver, and red tubercles. Spiracles light brown. True legs and prolegs green.

Fifth instar (Fig. d). Head. Diameter 5.3–5.7 mm. Color bluish green with light yellow

stripe extending from antennae, tapering dorsally to vertex of each lobe. Antennae light yellow. Clypeus green and cream. **Body.** Ground color green. Length 54 to 60 mm, width 10–12 mm. Dorsal and dorsolateral meso- and metathoracic scoli with green base, red shaft and yellow tip; shaft with short red knobs bearing short setae. A line of yellow tubercles cross over mid-dorsal area forming ridge between meso- and metathoracic dorsal scoli. Dorsal intersegmental area between meso- and metathoracic segments green. Dorsal and dorsolateral abdominal scoli somewhat triangular shaped with tips curved posteriorly; shaft silver with red tip, mesal portion red. Lateral and sublateral scoli reduced to red knob with small black setae extending from some. Mid-dorsal caudal scolus red with small red or cream colored knobs on shaft. Approximate scoli length: thoracic dorsal and dorsolateral, 5 mm; mid-dorsal caudal, 5.5 mm; dorsal abdominal, 2.2 mm; dorsolateral abdominal, 1.3 mm. All enlarged scoli are curved with their tips oriented posteriorly. Red spiracular line extends from A1 to A8. White to yellow subspiracular line extends from base of dorsolateral metathoracic scoli to A8. Ridge of small light yellow tubercles form collar on dorsoanterior portion of prothoracic segment. A more widely spaced ridge of smaller yellow tubercles start just dorsal to spiracular line and extend over back on posterior and anterior portions of each abdominal segment. Light yellow and red tubercles form ring around base of each true leg and proleg; forms semicircle below reduced red lateral scoli and diagonal pattern above base of prolegs. Ventral surface of A1, A2 and frequently A7 and A8 with enlarged red and yellow tubercles forming prominent transverse segmental ridge. Anal shield green with yellow or yellow and silver tubercles. True legs and prolegs green. Spiracles orange-brown.

DISCUSSION

Of the three species of *Sphingicampa* occurring in Arizona only the biology and distribution of *S. hubbardi* was previously known (Comstock, 1947). Although the general shape and appearance of the larvae are similar, there are numerous differences between the mature larvae of each species. Last instar *albolineata* larvae have blue dorsal and yellowish green dorsolateral meso- and metathoracic scoli. The dorsal and dorsolateral abdominal scoli are silver and yellowish green as is the mid-dorsal caudal scolus. The tubercles below the spiracular line are yellow and silver. Mature *montana* larvae have red dorsal and dorsolateral meso- and metathoracic scoli. The dorsal and dorsolateral abdominal scoli are red and silver and the mid-dorsal caudal scolus is red. The tubercles below the spiracular line are yellow and red. Finally, mature *hubbardi* larvae have purplish red and yellow dorsal scoli, and green and yellow dorsolateral meso- and metathoracic scoli. The dorsal and dorsolateral abdominal scoli are silver with a touch of red or pink and the mid-dorsal caudal scolus is purple or green. The tubercles below the spiracular line are yellow or yellow and red. During the early instars the larvae of *albolineata* have a dark maroon intersegmental patch on the dorsal surface between the meso- and metathoracic segments; *montana* and *hubbardi* larvae lack such a patch. Many additional differences between *albolineata* and *montana* larvae are revealed in the larval descriptions.

The cryptic coloration of *albolineata* and *montana* larvae make them very difficult to locate while feeding on acacia. The enlarged

blade-like dorsal and dorsolateral scoli break up the solid green pattern so that the size of the green patches are similar to those of the leaflets, and the silver scoli represent the space between leaflets. Larvae of *montana* on acacia are as difficult to locate as those of *albolineata*, but individuals reared on honeylocust were easy to locate. This is because the leaf on the honeylocust is 4–6 times larger than the acacia leaves. It might be expected that populations which feed on large leafed hosts would have some of the silver scoli reduced or absent so that the pattern would more closely match that of the leaves.

During the first four instars the dorsal and dorsolateral scoli of all three *Sphingicampa* species orient at 90° to the body, or slant forward (Fig. a). In the fifth instar, the dorsal and dorsolateral scoli are curved towards the posterior and a series of posterior slanting tubercles form a transverse ridge on the ventral surface of abdominal segments 1 and 2 and to a lesser degree on A7 and A8. The change in orientation of the prominent scoli and development of the ventral ridges are probably adaptations to help the larva enter the soil. Posteriorly oriented spines might reduce drag while entering the soil and could act to anchor the body and prevent it from slipping backwards as it pushes its way through the soil.

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